401 KAR 6:350. Monitoring well construction practices and standards.

RELATES TO: KRS 223.400 -223.460, 223.991, 224.01-400, 224.01-405, 224.43-010 -224.43-815, 224.46-012 -224.46-870, 224.60-100 -224.60-160, EO 2008-507, 2008-531

STATUTORY AUTHORITY: KRS 151.110, 223.435, 224.10-100, 224.70-100, 224.70-110

NECESSITY, FUNCTION, AND CONFORMITY: KRS 224.10-100, 224.70-100, and 224.70-110 authorize the cabinet to establish administrative regulations to protect water quality. KRS 223.435 requires the Secretary of the Cabinet to promulgate administrative regulations establishing standards of practice for water well construction. EO 2008-507 and 2008-531, effective June 16, 2008, abolish the Environmental and Public Protection Cabinet and establish the new Energy and Environment Cabinet. This administrative regulation establishes requirements for the construction of monitoring wells, including temporary monitoring wells, and provides minimum standards for location, construction, modification, and abandonment.

Section 1. General Requirements. (1) Certified monitoring well driller requirement. Each monitoring well shall be constructed, modified, or abandoned by natural persons certified in accordance with KRS 223.425 and 401 KAR 6:320.

(2) Construction and well performance requirement. Permanent and temporary monitoring wells shall be constructed, modified, and abandoned in such a manner as to prevent the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(3) Reporting requirement. Within sixty (60) days after completion, modification, or abandonment of a monitoring well or temporary monitoring well, the certified monitoring well driller shall submit a report of well construction to the cabinet.

(a) All information about the depth and the materials used in the monitoring well construction, modification, or abandonment shall also be recorded.

(b) The report shall be submitted on the form Uniform Kentucky Well Construction Record.

(4) Records to monitoring well owner. The certified monitoring well driller shall provide a copy of the Uniform Kentucky Well Construction Record to the monitoring well owner within sixty (60) days after a monitoring well has been constructed, modified, or abandoned.

(5) The certified well driller shall tag each well constructed or modified with a well identification number tag provided by the cabinet.

(a) An existing well identification number shall be included on the Uniform Kentucky Well Maintenance and Plugging Record for any well being modified or abandoned.

(b) If a well identification number does not exist at the time of modification or abandonment, the certified driller shall tag the well, as appropriate, and include the well identification number assigned in the Uniform Kentucky Well Maintenance and Plugging Record.

(6) Variance. If conditions exist or are believed to exist that preclude compliance with the requirements of this administrative regulation, the certified well driller may request a variance from the water well drillers program prior to well construction or well abandonment. The variance request shall be submitted in writing on the Kentucky Monitoring Well Variance Request form.

(a) The variance shall include the following:

1. A thorough description of the land use at the site and at adjacent and surrounding properties;

2. Distance between the proposed monitoring-well location and other existing water-supply wells or monitoring wells on adjacent properties;

3. Distance between the proposed monitoring-well location and potential pollution sources, both on site and on adjacent properties, including septic systems, sewers, petroleum and

chemical storage tanks, or other potential pollution sources;

4. A description of the geologic conditions expected at the site, including soil thickness, type of bedrock, if present, perched water, confining zones, and depth to groundwater;

5. A summary of the provisions, including the section numbers of this administrative regulation, for which the variance is requested;

6. A justification for the variance; and

7. Proposed construction, modification, or abandonment procedures to be used in lieu of compliance with this administrative regulation and an explanation as to how the alternate well construction procedures ensure the protection of the quality of the groundwater and the protection of public health and safety.

(b) Written variance procedure. The driller shall request a variance and obtain cabinet approval before well construction begins.

1. The driller shall submit the Kentucky Water Well Variance Request form, signed by the certified driller and well owner, and obtain written cabinet approval before well construction begins.

2. The cabinet shall notify the applicant in writing within ten (10) days of its decision to either grant or deny the variance.

3. The cabinet shall not issue a variance if the proposed water supply well construction will not ensure the protection of groundwater quality and public health and safety.

(c) Verbal variance for an emergency.

1. A driller may request a verbal variance for an emergency if the delay incurred due to the written variance procedure in paragraph (b) of this subsection may result in:

a. Loss of access to potable water for the intended user;

b. Failure to address an existing or impending environmental emergency in accordance with KRS 224.01-400; or

c. A risk to public health or safety.

2. The cabinet shall not issue a variance if the proposed water supply well construction will not ensure the protection of groundwater quality and public health and safety.

3. Within fifteen (15) days of the date the cabinet approves the verbal variance for an emergency, the water well driller shall submit to Kentucky Water Well variance Request form, signed by the certified driller and well owner, to the cabinet.

(d) The variance approval shall list the conditions of the variance, including:

1. The approved alternate well construction procedures;

2. The well sampling requirements; and

3. The requirement to notify surrounding property and well owners of the variance, if applicable.

(e) The certified well driller shall submit a copy of the Kentucky Monitoring Well Variance Request form, signed by the certified driller and the well owner, to the cabinet and the monitoring well owner within sixty (60) days after the well is completed.

Section 2. Design Factors. The certified monitoring well driller shall construct each monitoring well to comply with the following:

(1) Monitoring wells shall not be constructed in flood zones;

(a) If a reasonable location does not exist, monitoring wells may be constructed in flood zones providing the well is water tight and the well casing extends a minimum of two (2) feet above the maximum known flood elevation.

(b) Measures shall be taken during drilling and well construction to prevent the introduction or migration of contaminants to a water-bearing zone or aquifer;

(2) Water used in the drilling or decontamination process shall be potable; and

(3) Each water-bearing zone that is intercepted during the drilling phase but not intended for groundwater monitoring shall be sealed off to prevent down-hole cross contamination before advancing the borehole.

(a) Each water-bearing zone that is intercepted during the drilling phase but not intended for groundwater monitoring shall be prevented from contributing to a well by installing outer casing with a watertight seal.

(b) The permanent outer casing shall have a minimum two (2) inch annulus between the borehole and the outside diameter of the outer casing and a minimum two (2) inch annulus between the outer casing and the inner casing.

(c) The outer casing shall be grouted with sealing materials using a grout pipe.

(d) A minimum cure time following the sealing material manufacturer's recommendation shall be required before drilling through the grout seal.

(e) Temporary outer casing may be installed.

Section 3. Monitoring Well Construction. (1) General Requirements.

(a) All permanent and temporary monitoring wells shall be constructed, modified, and abandoned in a manner as to prevent the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(b) Monitoring wells shall be constructed in a manner as to yield both groundwater samples and groundwater-level measurements that shall be representative of the water-bearing zone or aquifer to be monitored.

(2) Boreholes.

(a)1. Boreholes drilled in unconsolidated formations shall be a minimum of four (4) inches greater than the outside diameter of the well casing and well screen except for sonic wells, direct push wells, and temporary wells.

2. The driller shall clean out the open borehole if soil or rock fall into the open borehole during auger or drill-stem retrieval.

(b) Boreholes drilled in consolidated formations shall be a minimum of two (2) inches greater than the outside diameter of the well casing and screen.

(c) Boreholes drilled by the hollow-stem auger or sonic drill method shall have a minimum auger or casing inner diameter (ID) for the following:

1. Four and one quarter (41/4) inches ID for the installation of two (2) inch monitoring well casing;

2. Six and one quarter (61/4) inches ID for the installation of four (4) inch monitoring well casing; or

3. Larger augers shall be required if installation difficulties due to geologic conditions or greater depths are anticipated.

(3)(a) Lubricant shall not be used on drill pipe threads, hollow-stem or solid-stem augers, or on the exterior of the drill pipe, unless approved in advance by the cabinet following the variance procedure in Section 1(6) of this administrative regulation.

(b) A request to use a lubricant shall be submitted in writing to the water well drillers program, and a Material Safety Data Sheet (MSDS) for the proposed lubricant shall be submitted with the request.

(4)(a) If the air rotary drilling method is used drill cuttings shall be contained.

(b) Air rotary drills using screw compressor systems shall have a coalescing filter system that captures excess entrained compressor oils.

(5) Drilling Derived Waste (DDW) shall be properly containerized.

Section 4. Monitoring Wells Completed Below Ground Surface. (1)(a) Flush mount wells

may be used for parking lot areas with high traffic, and limited space, such as Underground Storage Tank (UST) facilities, if installed in a manner that prevents surface water or contaminants from migrating into the well.

(b) Monitoring wells completed below ground surface shall have a flush-mount manhole with a bolt-down well cover and waterproof seals installed to prevent the inflow of surface water and contaminants.

(2) The concrete surface pad shall slope away from the monitoring well to prevent precipitation or contaminants from accumulating around the well.

(3) Waterproof seals shall be installed between the cover and the box, and O-rings or gaskets shall be installed around the bolts that mount on the cover.

(4) The cover shall consist of material able to withstand the maximum expected loadings.

(5) A water-tight lockable cap shall be attached to the top of the well casing.

(6) The well casing shall be cut so that the locking cap shall install properly and provide a waterproof seal.

(7) A flush-mount monitoring well shall have a concrete surface pad that shall be a minimum of four (4) inches thick with a minimum two (2) foot diameter or square pad centered on the well.

Section 5. Direct Push Monitoring Wells. (1) Direct push monitoring wells installed using direct push technology shall be constructed, modified, and abandoned in such a manner as to prevent the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(2) Temporary monitoring wells shall be constructed in such a manner as to yield both groundwater samples and groundwater level measurements that shall be representative of the water-bearing zone or aquifer to be monitored.

(3) Direct push monitoring wells shall also comply with the following additional standards:

(a) The outside diameter of the borehole shall be a minimum of one (1) inch greater than the outside diameter of the well casing;

(b) Premixed bentonite slurry or bentonite chips with a minimum of one-eighth (1/8) inch diameter shall be used in the sealed interval below the static water level; and

(c)1. Direct push monitoring wells shall not be constructed through more than one (1) water-bearing formation unless the upper water bearing zone is isolated by temporary or permanent casing.

2. The direct push tool string may serve as temporary casing.

(4) Prepacked well screens may be used.

Section 6. Temporary Monitoring Wells. (1) Temporary monitoring wells shall be constructed, modified, and abandoned in such a manner as to prevent the introduction or migration of contamination to a water-bearing zone or aquifer through the casing, drill hole, or annular materials.

(a) Temporary monitoring wells shall be constructed in such a manner as to yield both groundwater samples and groundwater level measurements that shall be representative of the water-bearing zone or aquifer to be monitored.

(b) The annulus between the borehole and the well casing shall be sealed at the surface with a bentonite seal to prevent surface water from migrating into the borehole.

(2) Each temporary monitoring well shall be properly abandoned within seventy-two (72) hours after the well was constructed.

(3)(a) A record of a temporary monitoring well constructed and abandoned shall be submitted by the certified driller on the Uniform Kentucky Well Maintenance and Plugging Record to

the cabinet and the monitoring well owner within sixty (60) days from the date abandoned.

(b) A copy of the Uniform Kentucky Well Construction Record and the Uniform Kentucky Well Maintenance and Plugging Record shall also be submitted to the Division of Waste Management program regulating the facility, if applicable.

Section 7. Materials for Monitoring Wells and Temporary Monitoring Wells.

(1) Well casing and screens.

(a) Monitoring well casing and well screen materials shall be constructed of materials determined on a site-specific basis to ensure that the integrity of the material shall not be affected by contaminants or introduce contaminants to the groundwater.

(b) Well casing and screens shall be resistant to chemical and microbiological corrosion and degradation.

(c) Monitoring well casings and screens shall be able to withstand the physical forces acting upon them during and following their installation, and during their use. This includes force due to suspension in the borehole, grouting, development, purging, pumping, sampling, and forces exerted on the well casing and screens by the surrounding geologic materials.

(d) The certified driller shall not install used, damaged, or contaminated well casing or screens.

(e) Well casing and screens shall have a minimum inside diameter of two (2) inches except for direct push and temporary wells.

(2) Joints and couplings.

(a)1. All joints and couplings shall be flush type.

2. All joints shall be watertight.

(b) The monitoring well casing shall extend a minimum of two and one half (2 1/2) feet above ground surface, except as provided for in Section 4 of this administrative regulation.

(c)1. A minimum annular space of two (2) inches shall be maintained between the borehole wall and the outside diameter of the monitoring well casing.

2. In a multi-cased monitoring well the annulus between the well casings shall be a minimum of two (2) inches.

(d) Centralizers shall be used in monitoring wells greater than fifty (50) feet in depth.

(e) Centralizers shall be installed at a minimum of ten (10) foot intervals.

(3) Filter pack.

(a)1. The filter pack materials shall consist of clean, rounded to well-rounded, insoluble particles of quartz silica composition.

2. The filter pack materials shall be of a size that minimizes head losses through the filter pack and prevents sediment movement through the well screen into the well.

(b) The filter pack shall be placed in the annulus in such a manner as to prevent bridging. At a minimum the filter pack shall be placed slowly and carefully by the free-fall method.

(c) The depth to the filter pack shall be continually monitored during installation.

(d)1. A minimum of six (6) inches of filter pack shall be placed below the bottom of the well screen.

2. The filter pack shall extend at least two (2) feet above the top of the well screen.

(e) Prepacked well screens may be used if the filter-pack material, filter-pack grain size, and the screen slots are properly sized for the monitoring zones.

(4) Sealing Materials.

(a) Only potable water shall be used in mixing sealing materials used in the construction or abandonment of monitoring wells.

(b) The sealing material shall be placed in the annulus by a grout pipe, starting at the top of the bentonite seal to within three (3) feet of the ground surface.

(c) Side-discharge grout pipes shall be used if sealing the annulus for wells that are 100 feet deep or greater.

(d) The concrete surface pad or surface casing shall not be installed until the sealing materials placed in the annulus have settled and cured.

(e) Bentonite seal.

1. The bentonite seal shall consist of high solids sodium bentonite pellets with a minimum of thirty (30) percent solids and shall be placed in the annulus by a method that ensures the prevention of bridging.

2.a. The depth to the bentonite seal shall be continually monitored during installation.

b. The bentonite seal shall extend a minimum of two (2) feet above the top of the filter pack.

3.a. Hydration time of the bentonite seal shall be according to the manufacturer's recommendation.

b. Only potable water shall be used, if necessary, as the hydration medium.

c. The surface opening and the annulus shall be protected during the hydration period to prevent material from falling into the borehole.

(f) Annular seal.

1. The annular seal shall be installed in such a manner as to prevent the migration of contaminants or pollutants along the monitoring well annulus into the well.

2. The sealing material shall be placed so that pollutants cannot migrate through the annulus.

3. The sealing materials shall not have a harmful effect on the well casings or screens or damage the surface completion of the well.

Section 8. Surface Completion. (1) Surface casing.

(a) Monitoring wells completed with the well casing extending above ground surface shall be constructed with a steel, anodized aluminum, or PVC outer protective surface casing with a locking cap.

(b) A water tight well cap shall be installed on the well casing.

(c) The well casing shall be cut in a manner so that the locking cap shall install properly and provide a waterproof seal.

1.a. Outer protective surface casings shall have a minimum of two (2) inches of clearance between the inside diameter of the outer protective casing and the outside diameter of the well casing.

b. The outer protective surface casing shall extend a minimum of one (1) inch and a maximum of twelve (12) inches above the inner well casing.

c. The outer protective surface casing shall be installed by pouring a concrete slurry mix into the borehole from the top of the annular seal to the ground surface.

2. The outer protective surface casing shall then be pushed into the wet concrete slurry a minimum of two (2) feet below the ground surface.

3. The outer protective surface casing shall have a minimum of two (2) weep holes for drainage. The weep holes shall be a minimum diameter of one-quarter (1/4) inch and shall be located directly above the top of the concrete surface pad.

4. The outer protective surface casing shall bear the Kentucky Water Well Tag with the water well number.

(2) Bumper guards. Monitoring wells extending above ground surface shall have four (4) protective bumper guards consisting of steel pipes a minimum of three (3) inches in diameter and a minimum of five (5) feet in length.

(a)1. The bumper guards shall be installed to a minimum depth of two (2) feet below ground surface in a concrete footing and shall extend a minimum of three (3) feet above ground sur-

face.

2. Concrete shall be placed into the steel pipe bumper guards for additional strength.

(b) The bumper guards shall be painted a highly visible color.

(c) A modification to the bumper guard requirement shall be pre-approved by the water well drillers program according to the variance procedure in Section 1(6) of this administrative regulation.

(3) Concrete surface pad.

(a) All monitoring wells shall have a concrete surface pad a minimum of six (6) inches thick with a minimum three (3) foot diameter or square pad centered on the well.

(b) The concrete surface pad shall slope away from the monitoring well in a manner as to prevent precipitation or contaminants from accumulating around the well.

Section 9. Well Development. (1) Newly installed monitoring wells shall be developed until the column of water in the well is free of visible sediment.

(2) This well-development protocol shall not be used as a method for purging prior to water quality sampling.

Section 10. Repairs or modifications to the well casing shall be performed by a certified monitoring well driller and shall be reported to the water well drillers program on the Uniform Kentucky Well Maintenance and Plugging Record.

Section 11. Monitoring Well Abandonment. (1) General requirements. A monitoring well that has been damaged or is otherwise unsuitable for use as a monitoring well, shall be abandoned within thirty (30) days from the last sampling date or thirty (30) days from the date it is determined that the well is not longer suitable for its intended use.

(a) Monitoring wells shall be abandoned in such a manner as to prevent the migration of surface water or contaminants to the subsurface and to prevent migration of contaminants among water bearing zones.

(b) A Division of Waste Management program that permits or regulates the facility at which a monitoring well is to be abandoned shall be notified a minimum of ten (10) working days prior to abandonment of each monitoring well.

(c) Each temporary monitoring well shall be abandoned within seventy-two (72) hours after installation.

(d)1. A record of the monitoring well abandonment shall be submitted by the certified driller on the Uniform Kentucky Well Maintenance and Plugging Record to the water well drillers program within sixty (60) days from the date abandoned.

2. A copy of the Uniform Kentucky Well Maintenance and Plugging Record shall be submitted to the cabinet program regulating the facility, if applicable.

(2) Abandonment methods and sealing materials for all types of monitoring wells.

(a) The surface casing, monitoring well casing, well screen, filter pack, bentonite seal, and cement shall be removed.

(b) The borehole shall be plugged with sealing material by grout-pipe method or by pressure injection from the bottom of the boring to the top of the borehole, except as provided in paragraph (c) of this subsection.

(c) The borehole may be plugged using the gravitational displacement, or free-flow method to a maximum depth of fifty (50) feet. If this method is employed, the well driller shall use bentonite with a minimum particle size of three-eighths (3/8) inch, and the bentonite shall be used according to the manufacturer's recommendation.

(d) The top two (2) feet of the borehole shall be filled with materials consistent with the sur-

rounding ground surface.

(e) If the well casing cannot be removed, an alternate method of abandonment may be employed, if approved in advance by the cabinet in accordance with the variance process in Section 1(6) of this administrative regulation.

Section 12. Division of Waste Management Program Requirements. (1) Prior to the installation or abandonment of a monitoring well at a facility regulated by the Division of Waste Management, all monitoring-well construction designs and all monitoring-well materials shall be pre-approved by the Division of Waste Management in accordance with the requirements in KRS 224.01-400, 224.01-405, 224.43-010 through 224.43-815, 224.46-012 through 224.46-870, and 224.60-100 through 224.60-160.

(2) The Division of Waste Management regulating program shall be notified at least ten (10) working days prior to a monitoring-well construction, modification, or abandonment so that a cabinet representative may be present at the construction, modification, or abandonment.

(3) A copy of the Uniform Kentucky Well Construction Record and the Uniform Kentucky Well Maintenance and Plugging Record shall be submitted to the Division of Waste Management program regulating the facility, if applicable.

Section 13. Documents Incorporated by Reference. (1) The following material is incorporated by reference:

(a) "Uniform Kentucky Well Construction Record", April 2008;

(b) "Uniform Kentucky Well Maintenance and Plugging Record", April 2008; and

(c) "Kentucky Monitoring Well Variance Request", July 2008.

(2) This material may be inspected, copied, or obtained, subject to applicable copyright law, at the Division of Water, 300 Sower Boulevard, Frankfort, Kentucky 40601, Monday through Friday, 8 a.m. to 4:30 p.m. This material is also available on the Division of Water Web site, www.water.ky.gov. (35 Ky.R. 605; 811; eff. 10-8-2008; TAm eff. 7-8-2016.)